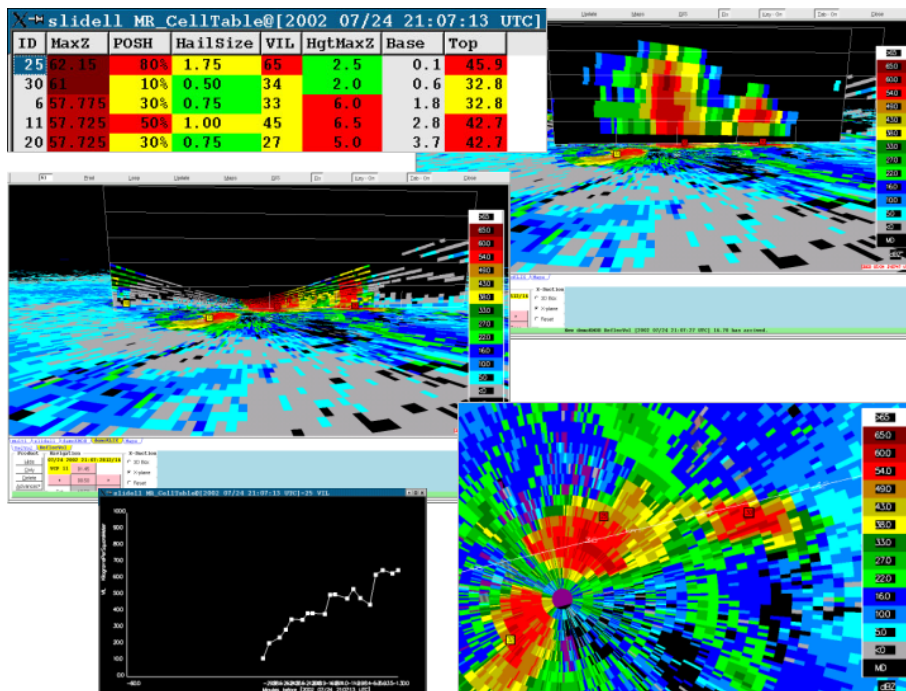


NATIONAL SEVERE STORMS LABORATORY

WICHITA KANSAS NWSFO

WARNING DECISION SUPPORT SYSTEM – INTEGRATED INFORMATION (WDSSII) PROOF-OF-CONCEPT TEST

APPENDIX B – w2 DISPLAY USER GUIDE



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The WDSS-II (w2) display User Guide for Wichita NWSFO (updated 3/26/03)

NOTE: WDSS-II is a new multi-source display and that is still *under development*. As such, **your feedback is very important**, as it will help shape the look and feel of the display and will help guide the path of NWS multi-sensor and multi-source algorithm development and eventual operational implementation. You should expect some awkward display interface issues, some bugs, and some things that may not be very intuitive just yet. Please report these to the developers! It will help us to prioritize which things need to be implemented or improved. Please send feedback to wdssii_feedfack@nssl.noaa.gov each time you have trouble or a suggestion.

Starting the WDSS-II display (hereafter known as “w2”):

- 1) If not logged in already, you may log in at the WDSSII Display Machine in the NWSFO warning area as:
Username: w2user
Password: (ask an NSSL meteorologist)
- 2) Click on:
 - a. The “WDSS-II (Start Fresh)” icon to start w2 with only the base maps (no data) and local data source directories.
 - b. The “WDSS-II (Restore Session)” icon to start w2 in the state that it last exited (complete with data sets that were last loaded).
 - c. Look for other icons as new practice demo cases are added.

Exiting w2:

From the Product Selection Window, hit the “Exit” button, or choose Exit from the “File” pulldown menu (Fig. 1). The Exit Program window will pop up, and you make the choice.

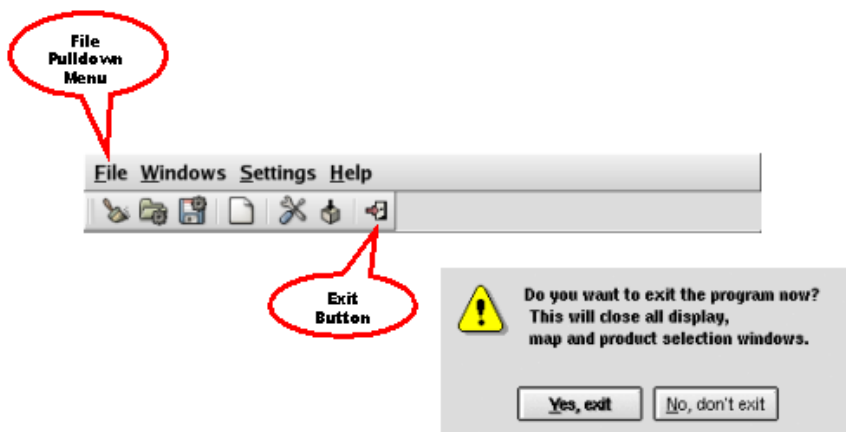


Figure 1. Exiting w2.

The Product Selection window:

- 1) Click on the “Products” button (Fig. 2) to bring up the list of data sources (multi, KDDC, KICT, KINX, KTWX, KVNIX, and NSE)



Figure 2. Product Selection Button at top of display window.

- 2) Double clicking on a product name (left column) will load the product into the w2 display window. If the product is a volume product (does not say “default” in the middle column), the lowest elevation angle (or lowest height) and the most current product will load. You can override the elevation angle by double-clicking your choice from the middle column (and the most current product from that elevation angle will load). You can override the time of the product by double-clicking the time from the right column. The list of useful products at this time include:

Single-Radar products (Fig 3):

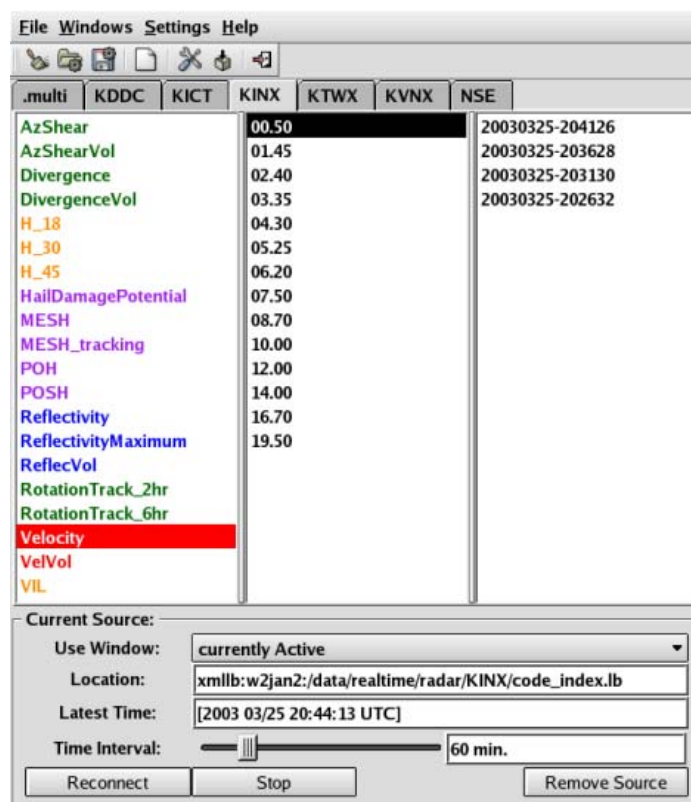


Figure 3. Single Radar Products as listed in Product Selection Window.

a) Base Data Products:

ReflectVol → Reflectivity “virtual volume” product. This will always display the latest data from all tilts (e.g. data may be from 2 different volume scans). You can easily step up and down through the data.

VelocityVol → Velocity “virtual volume” product. Velocity images can be converted to Storm Relative Velocity by choosing a storm motion vector (see section **Display Window: Gridded Image Products**).

Reflectivity → Base Reflectivity. Must choose particular elevation scan angle.

Velocity → Base Velocity. Must choose particular elevation scan angle. Velocity images can be converted to Storm Relative Velocity by choosing a storm motion vector (see section **Display Window: Gridded Image Products**).

b) Gridded high-resolution (polar grid: 1 km x 1°), rapidly updating products. Updates after each new elevation scan/tilt arrives (~20 second updates rather than 5-6 minute updates). These are alternates to both cell-based products and 4 km² Cartesian gridded products:

ReflectivityMaximum → The maximum reflectivity in the vertical column (otherwise known as Composite Reflectivity).

VIL → Vertically Integrated Liquid.

H_18 → 18 dBZ Echo Top.

H_30 → 30 dBZ Echo Top.

H_45 → 45 dBZ Echo Top.

POH → Probability of Hail (any size).

POSH → Probability of Severe Hail (3/4” or greater).

MESH → Maximum Estimated Hail Size.

MESH_Tracking → Hail Swath product, showing swath of maximum hail size. Duration is for 2 hours.

HailDamagePotential → Hail Swath product, showing swath of Hail Damage Potential (a proxy combining accumulated hail size and duration of severe hail). Duration is for 2 hours.

AzShear → Linear Least-Squares Derivative (LLSD) of Velocity for Azimuthal Shear, a proxy for Rotation (cyclonic and anticyclonic).

AzShearVol → LLSD Rotation (Azimuthal Shear) “virtual volume” product.

Rotation Track_2hr → LLSD Rotation (Azimuthal Shear) Track product, showing swath of maximum rotation. Duration is for 2 hours. Useful for tracking mesocyclones and for post-event verification.

Rotation Track_6hr → LLSD Rotation (Azimuthal Shear) Track product, showing swath of maximum rotation. Duration is for 6 hours. Useful for tracking mesocyclones and for post-event verification.

Divergence → Linear Least-Squares Derivative (LLSD) of Velocity for Radial Shear, a proxy for divergence (and convergence).

DivergenceVol → LLSD Divergence (and convergence) “virtual volume” product.

Multi-sensor products (Fig. 4):

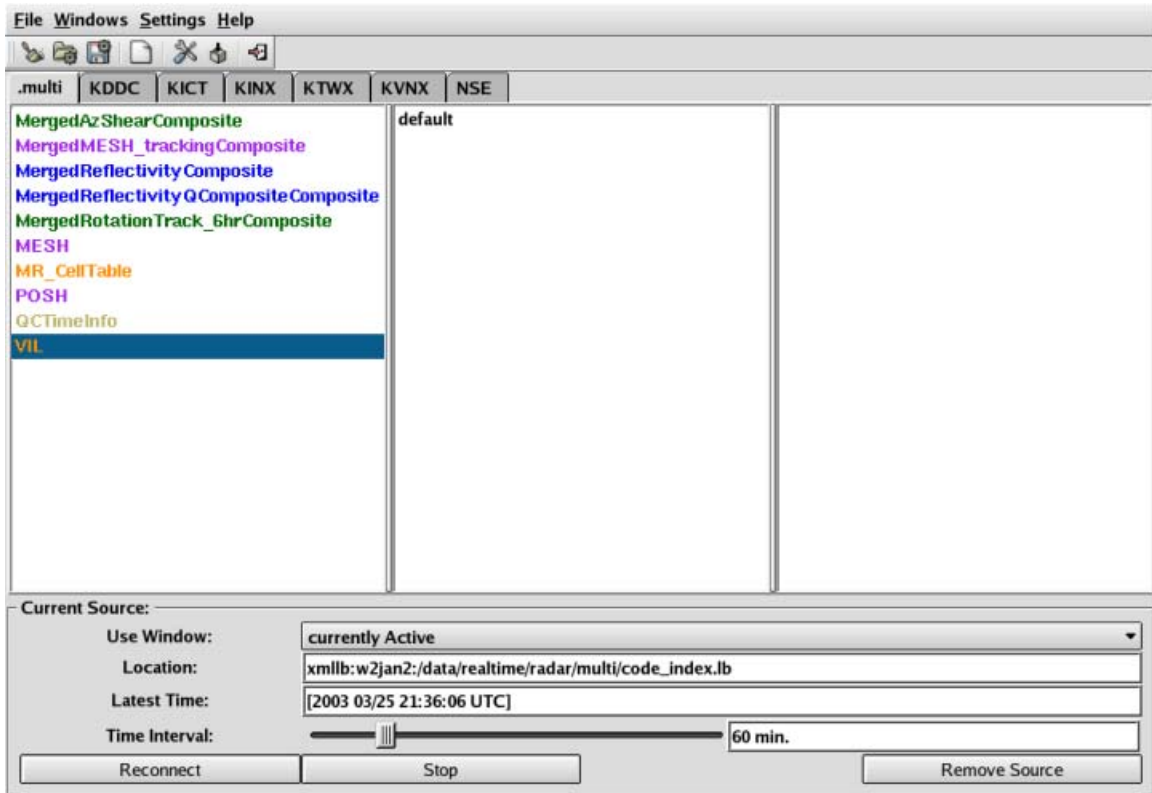


Figure 4. Multi-Radar Products as listed in Product Selection Window.

a) Multiple-Radar SCIT and HDA:

MR_Celltable → Multi-radar equivalent of the WDSS SCIT and HDA algorithms for cell tracking and hail diagnosis. This presently provides cell-based VIL and hail information based on the integration of storm cell information from multiple radars. For instance, a cell that is in KICT's "cone of silence" will have the upper levels of the storm filled in by neighboring radars, therefore providing more accurate VIL and hail calculations. The algorithm also updates in a rapidly updating fashion, with 60-second updates using the 2D SCIT cell features from the latest virtual volume scan from all radars.

b) Multiple-Radar gridded high-resolution (approx. 1 x 1 km), rapidly updating products. Updates every 60 seconds (rather than 5-6 minute updates). These are multiple-radar versions of the single-radar gridded polar products:

MergedReflectivityComposite → Multiple-Radar maximum reflectivity in the vertical column composite (otherwise known as Composite Reflectivity).

MergedReflectivityQCompositeComposite → Same as above, but running an experimental filter to remove non-precipitation returns (e.g., AP, clutter, chaff, and clear-air return are removed). *NOTE: This product may not be available at times.*

VIL → Multiple-Radar Vertically-Integrated Liquid composite

POSH → Multiple-Radar Probability of Severe Hail composite

MESH → Multiple-Radar Maximum Estimated Hail Size composite

MergedMESH_trackingComposite → Multiple-Radar Hail Swath Composite, showing swath of maximum hail size. Duration is for 2 hours. *NOTE: This product may not be available at times.*

MergedAzShearComposite → Multiple-Radar LLSD Rotation (Azimuthal Shear) Composite

MergedRotationTrack_6hrComposite → LLSD Rotation (Azimuthal Shear) Track composite product, showing swath of maximum rotation. Duration is for 6 hours. Useful for tracking mesocyclones and for post-event verification over multiple-radar domain.

c) Multiple-Radar Calibration information:

QCTimeInfo → This table currently provides information on the time of arrival of the latest product for each data source as well as the time difference of the product's time stamp from the local algorithm machine (synced to an atomic clock). For radars, this time difference should be in the +30 to +50 second range. If not, the time that the radar is reporting may be incorrect (for instance, negative numbers for the time difference are in the future...), and you want to notify your technicians that the clock has drifted from the official atomic clock time.

d) Near-Storm Environment information (from the **NSE** product tab). These are derived from the RUC 20km hourly analyses and are used as input for the MR-HDA and gridded HDA algorithms. More parameters may be added later:

HeightOf0C → Height of the 0° C level.

HeightOf-20C → Height of the -20° C level.

UWindMean0-6km → 0-6 km mean u-component of wind.

VWindMean0-6km → 0-6 km mean v-component of wind.

The WDSS-II Display Window:

Display window: top (Fig. 5)

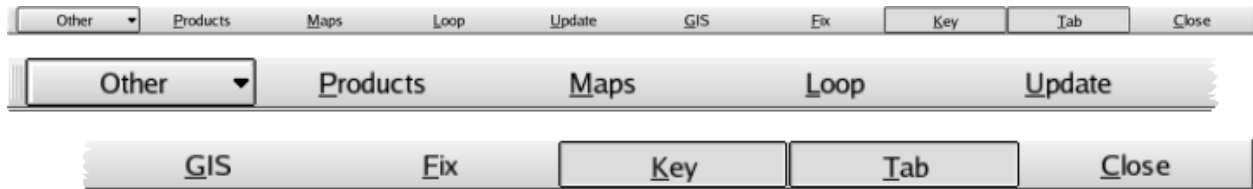


Figure 5. Button bar at top of display window (top – entire bar, middle and bottom – left and right sides enlarged).

- Other ▼:** “Name Window” Allow user to name the window (will show up in title bar).
- Other ▼:** “Save Snapshot as...” Allow user to save a snapshot image of the window.
- Product:** Brings the Product Selection menu to the foreground.
- Maps:** Allows you to select which map overlays you want.
- Loop:** Animates the current set of products. Looping works best with only 1-3 products loaded, and using a separate window. WARNING: Looping does not work well with Volume products. Looping parameters are set in the Preferences (see “Preferences” section).
- Update:** When turned on, it will automatically load in new products as they arrive. In real-time operations, this defaults to ON and should remain set to ON most of the time.
- GIS:** If turned on, clicking on a detection icon in the main window will show some geographic information. See also the section on "Display Window: Maps"
- Fix:** "Fix" the view to the point on the Earth's surface that is currently in the middle of the screen. This allows you to rotate and zoom about this point (see "Mouse Controls" section)
- Key:** Turn on/off the colormap key on the right of the display
- Tab:** Turn on/off the product tabs at the bottom of the display
- Close:** Close the present window (one for each of multiple windows, if you are running more than one window). This does not completely shut down the display (see the “Exit” instructions at the start of this guide).

Display window: Mouse Controls

NOTE: WDSSII uses a three-button mouse for control. Note that the middle mouse button is smaller and is also a roll-wheel. The roll-wheel has no function in WDSSII. Just depress the button (wheel) for the middle button features.

1) With "Fix" button off:

hold left mouse:	roam (pan) in the direction you move the mouse
hold middle mouse:	move "up" to zoom in, "down" to zoom out
right mouse:	nothing

2) with "Fix" button on:

hold left mouse:	rotate the view
push up:	rotate to view from above
push down:	rotate to view from the side
push left:	rotate counterclockwise
push right:	rotate clockwise

hold middle mouse:	move "up" to zoom in, "down" to zoom out
hold left mouse:	if in "3D box" mode, move forward and backward through the 3D box, and a dynamic cross-section, built perpendicular to your line of sight, will be displayed. When you release the button, the dynamic cross-section becomes static, and you can then "fly around" this new cross-section.

Display window: some general information

WDSS-II displays all data in time synchronized, three-dimensional earth-relative coordinates. This means that you can combine data from many different sources in the same window while maintaining the correct mapping of the data relative to each other in 3D space. Cross-sections of data will be mapped with no horizontal or vertical stretching.

Notes:

- It is possible to have multiple radars overlaying the same area on the earth. In fact, if you use the Fix button and rotate to view the elevation slices from the side, you can see how they relate to each other in space (e.g., if one is above the other)
- CAUTION!! Since you are looking down upon a 3D data field, there will be some parallax toward the edges of the screen (similar to a satellite image). Therefore, if you

want to find the exact location of a feature you should move it to the middle of the screen (beneath the cross-hairs) to get the true location.

- WARNING!! As with any computer – you **can** max out the memory if too many products are loaded at the same time (especially volume products). If we start seeing the display starting to slow down when roaming or zooming, you may need to delete some of the overlays.

WDSSII allows for multiple windows (see Fig. 11), but it is probably best to overlay all sources in the same window while beginning use on the system. The more-experienced users can start experimenting with multiple windows (especially for looping).

Display window: Gridded Image Products

The "tabs" at the bottom of the screen help control which data source is most prominent and displayed on the top-viewing layer (Fig. 6). The "current source" (e.g. KICT) is highlighted in yellow, and the "current product" (e.g., MESH) is highlighted in yellow on a sub-tab. Under the tabs is the window with the **Products** and **Navigation** controls. When viewing a **Velocity** image, a third window on the right is included, the **Storm Motion** selection window (shown in the figure below for completeness).

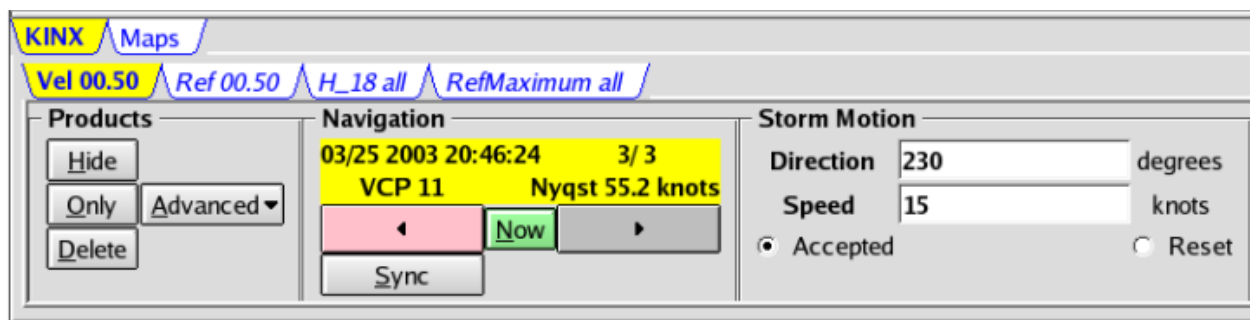


Figure 6. Gridded Image Product Controls.

On the far left of the window under the tabs are the **Products** controls. NOTE – some of these buttons toggle two options – only one is show in the figure above:

- **Hide (Unhide):** hide/unhide this product from view
- **Only (Revert):** show only this product (when it is the "current product"). This is useful when you want to take a close look at a data field from a specific source and to blank out other data from cluttering your view.
- **Delete:** delete this product from the tabs and from memory. Use this to free up resources when you don't expect to revisit a product any time soon.

- **Advanced:** the things you need to worry about here are:
 - ✓ **Data Readout** - when checked, show the data values at the cursor, along with azimuth/range/height (heights and ranges are in km for the time being). You can change what is shown by looking at the "Preferences/Read out options" tab on the product selection window.
 - ✓ **Show Polar Grid** - for radars, you can turn a polar grid on/off. For the time being, these are hardwired to 25 nm intervals.

On the right part (or center if viewing a Velocity image) of the window under the tabs are the **Navigation** controls, which control rapid browsing through the data:

- ◀ step back in time by one volume scan
- ▶ step forward in time by one volume scan (unless gray, in which case you are already at the latest time)
- Now If pink, this button will jump ahead to the most current data (info in status bar at bottom of display). If green, already at the latest time.

If viewing a Velocity image, the right part of the window under the tabs is the **Storm Motion** controls. Velocity images can be converted to Storm Relative Velocity by entering in a storm motion vector (**Direction** and **Speed**) and hitting **Accept**. NOTE: Only the current and subsequent velocity images will have the new motion vector applied. This motion vector will not apply to previous images. The **Reset** button will reset the motion vector to the default vector (currently zero).

Display window: Graphical Algorithm Products

These are the controls to manage graphical algorithm output information, which includes tables, overlay icons, past tracks, forecast tracks, and trends.

The "tabs" at the bottom of the screen help control which data source is most prominent and displayed on the top-viewing layer (Fig. 7). The "current source" (e.g. KICT) is highlighted in yellow, and the "current product" (e.g., MR_CellTable) is highlighted in yellow on a sub-tab. Under the tabs is the window with the **Products**, **Navigation**, **Table Mgmt** (table management), and **Query** controls.

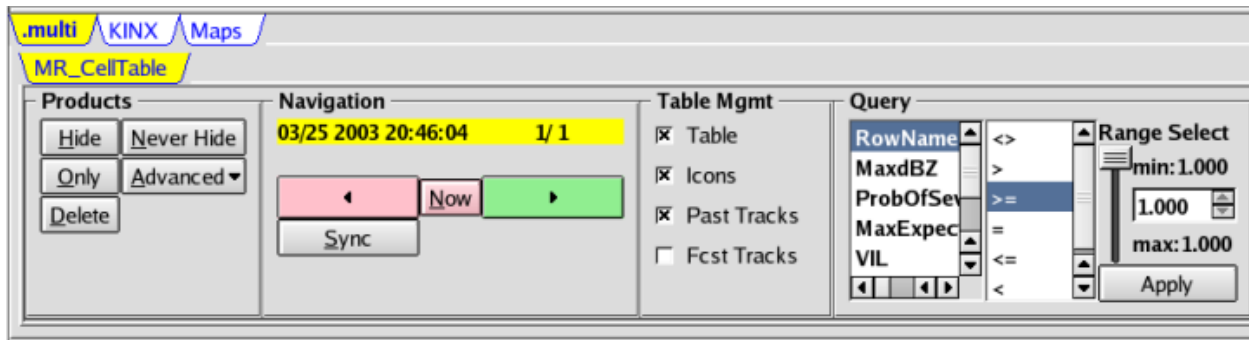


Figure 7. Graphical Algorithm Product Controls

The **Products** control works exactly the same way with gridded image products except for an additional button:

- **Never Hide:** Toggling this button causes the algorithm icon overlays to always be shown, regardless if an individual image is selected for “Only” viewing.

The **Navigation** control works exactly the same way with gridded image products.

On the right-center part of the window under the tabs are the **Table Mgmt** controls, which control viewing of tables, icons, past tracks, and forecast tracks. These are all toggle buttons, and turn off/on exactly what they say.

Here is a sample **Table** (Fig. 8):

ID	MaxZ	POSH	HailSize	VIL	HgtMaxZ	Base	Top
1	66	80%	41.6	49	6.0	4.7	15.5
10	61	50%	26.9	42	6.5	2.2	12.5
3	61	50%	28.6	29	8.0	4.6	8.0
17	59	50%	27.8	44	7.0	4.4	14.0
26	58	70%	39.1	50	11.5	3.6	15.5
7	58	50%	24.9	35	8.5	3.6	13.0
6	57	40%	21.6	32	7.5	4.5	12.5
27	56	0%	11.2	27	6.0	2.2	12.0
14	54	0%	11.1	29	5.0	0.7	8.5
18	53	0%	11.2	16	4.5	4.4	11.5
19	50	0%	3.1	12	5.0	0.5	5.0
9	50	0%	8.5	15	3.5	3.4	11.5
5	50	0%	1.5	10	2.0	0.7	4.5

Figure 8. Example Algorithm Table.

Table features include:

- Values are color coded (red-yellow-green) by severity. The threshold values can be changed easily (ask NSSL staff for help).
- Left-mouse click on column header will sort rows in the table based on the column values. Each left-mouse click will alternate between an ascending sort and a descending sort.
- Left-mouse click on any value in any row will cause the display to re-center and zoom in on the storm cell ID corresponding to that row.
- Middle-mouse click on any value in any row will launch a one-hour trend of the information for that particular storm cell ID. Note – **every attribute** can be trended! This is not so with the legacy WDSS.
- Slider bar on the right will allow you to move up/down rows in the table.

On the right-most part of the window under the tabs are the **Query** controls (Fig. 9). If there is an overabundance of cell detection icons, you can filter out the weak ones by using this feature. To use:

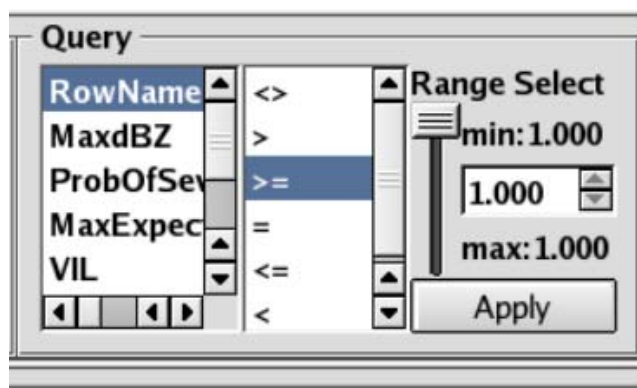


Figure 9. Algorithm Icon Query Control.

- 1) select the item you want to filter by (e.g. VIL)
- 2) select the logical operand. For example, ">=" will display only detection greater than or equal to your selected value.
- 3) use the slider bar to select a threshold, and the actual value will appear in the box on the right. (NOTE: the max and min of the values in the table are shown above and below the box. You can also manually select a value by typing and entering in the box, or using the up/down arrows.)
- 4) Hit the "Apply" button. The icons on the screen will be filtered based on your selection.

NOTE: The filter only applies for the current virtual volume scan times. We are working to make this apply to all volume scan times.

Display window: “Virtual Volume” Gridded Image Products

These are the primary products for browsing base data (e.g., ReflectVol, VelVol) and the LLSD velocity derivatives (e.g., AzShearVol, DivergenceVol). They update as each tilt arrives, so you will always have the latest data available for all elevation scans. These are called "virtual volume scans".

The "tabs" at the bottom of the screen help control which data source is most prominent and displayed on the top-viewing layer (Fig. 10). The "current source" (e.g. KICT) is highlighted in yellow, and the "current product" (e.g., ReflecVol) is highlighted in yellow on a sub-tab. Under the tabs is the window with the **Products**, **Navigation**, and **X-Section** controls. The **Products** controls work exactly the same way as already described above.

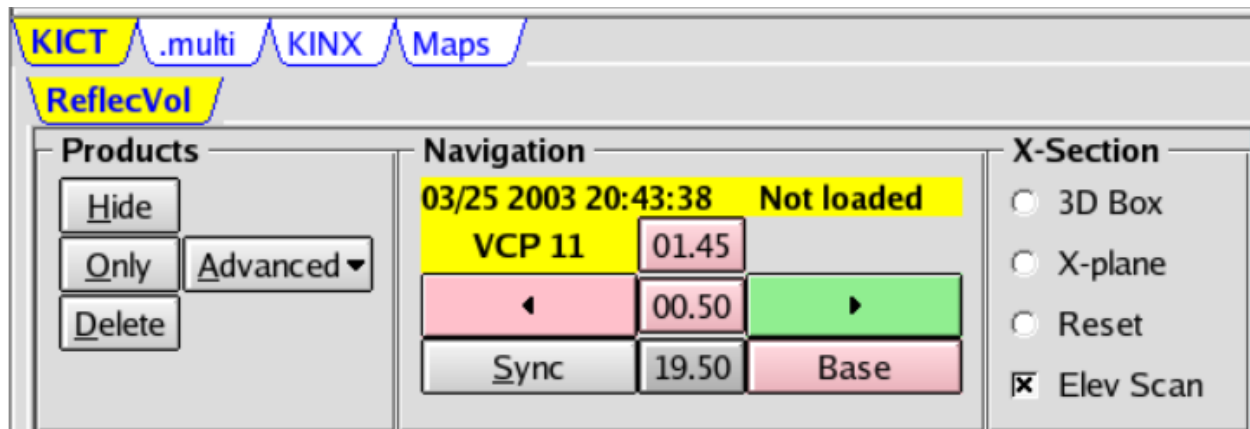


Figure 10. "Virtual Volume" Gridded Image Product Controls

On the middle part of the window under the tabs are the **Navigation** controls, which control rapid browsing through the data. For the virtual volume products, these work a little more sophisticated.

- ◀ step back in time by one volume scan
- ▶ step forward in time by one volume scan (unless gray, in which case you are already at the latest time)
- The middle row of buttons (0.50, 1.45, ... 19.50) controls the elevation angle. The middle button is the current elevation angle. Push the top button to select the next higher elevation (wraps back to the bottom if you are at the top, and the opposite for the bottom button to the top), and the bottom button to move down. There is no **Now** button for volume products.
- Green buttons show that the data are from the current volume scan, while red buttons indicate that the data are from the previous volume.

Base: select the lowest elevation angle

Sync: synchronize all data sources to the time of the data set you are currently browsing.

On the right part of the window under the tabs are the **X-Section** controls, which allow you to manipulate volume data in three-dimensions:

- **3-D box:** This product allows you to dynamically cut cross-sections through volumetric data perpendicular to the user's field of view.
 - 1) select "**3D Box**"
 - 2) use the left mouse to draw (hold-draw-release) a small box around the storm you are interested in. Best keep these to one or two storms. This automatically turns on the "Fix" button.
 - 1) right-click in the display window to draw the box.
 - 2) left-mouse to rotate to desired viewing angle and middle-mouse to zoom in and out.
 - 3) **hold right-mouse** and move through the data to see cross-section dynamically change. Release the right mouse to "freeze" the cross-section plane.
 - 4) left-mouse to rotate to desired cross-section plane viewing angle and middle mouse to zoom in and out.
 - 5) click "**Reset**" to remove the box and turn off the "Fix" button.
- **X-plane:** this is more like the traditional cross section
 - 1) select "**X-plane**"
 - 2) use the left mouse to draw (hold-draw-release) a line across the storm you are interested in.
 - 3) right-click in the display window to draw the plane. This automatically turns on the "Fix" button.
 - 4) left-mouse to rotate to desired cross-section plane viewing angle and middle mouse to zoom in and out.
 - 5) click "Reset" to remove the plane and turn off the "Fix" button.

To get a clear view of the plane, you may find it useful to click the "Only" button so that you are only viewing data from the single source.

- **Reset:** As described above – this button will remove you 3D Box or X-Plane and turn off the "Fix" button so you can return to another 3D Box, X-Plane, or back to normal product browsing.
- **Elev Scan:** If the elevation tilt is also in your way, you can toggle it off and on using this button.

Display window: Maps

There is not a good interface for maps yet (improvements are planned). To select a map, push the "**Maps**" button at the top of the window and select the maps you desire (toggle on/off). If you want to display city or county names, then:

1. click the "**Maps**" tab at the bottom
2. click the map type tab (e.g. ict_counties)

Under the tabs is the window with the **Text**, **Figure**, and **Filter** controls. Do not use the **Figure** and **Filter** controls for now. To use the **Text** controls:

1. choose "Name" (for cities) or "CountyName" (for counties) from the **Column** drop down menu.
2. use the up/down arrows to choose a **Size** of "10"
3. choose a **Color**.
4. click "**Draw**"

To remove the names (they can sometimes get in the way of viewing the data), click the "GIS" button at the top of the display window.

We have loaded up street-level maps for all the counties within your CWA. We recommend using these only during event verification, as the shapefiles are memory intensive.

If you have an ArcView shape file with a specific purpose (e.g. damage survey maps, etc.), then it can be added to WDSS-II. Just ask the NSSL staff to help.

Other settings:

From the Product Selection Window, you can do some other functions (Fig. 11):

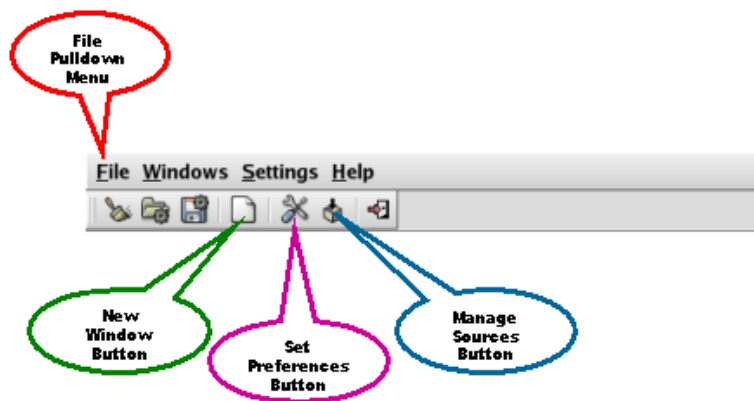


Figure 11. Other Product Selection Functions.

- **New Window** – Launches a new display window, one that can hold different products.
- **Set Preferences** – A way to set display preferences (which can later be imported or exported, see Fig. 12). There are several sub-menus for particular preference settings. We recommend only the advanced user to use these for now.

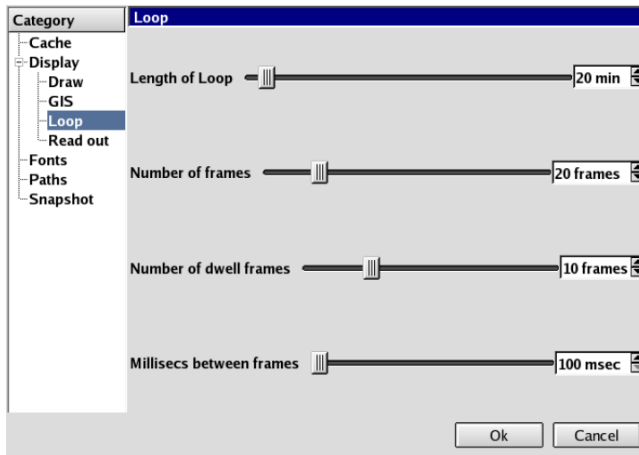


Figure 12. Preferences Control Window.

- **Manage sources** – Don't use this – we've got this all set up for your CWA domain when you start w2.
- **Save (Export) Preferences** – For the advanced user – you can save your preferences (Fig. 13). We can show you how to load up w2 with your personal preferences if you wish – or create a new desktop icon just for you.
- **Load (Import) Preferences** – For the advanced user – you can load your preferences from an already-saved preference file (Fig. 13).
- **Clear Preferences** – To clear the preference settings and reset to the defaults.

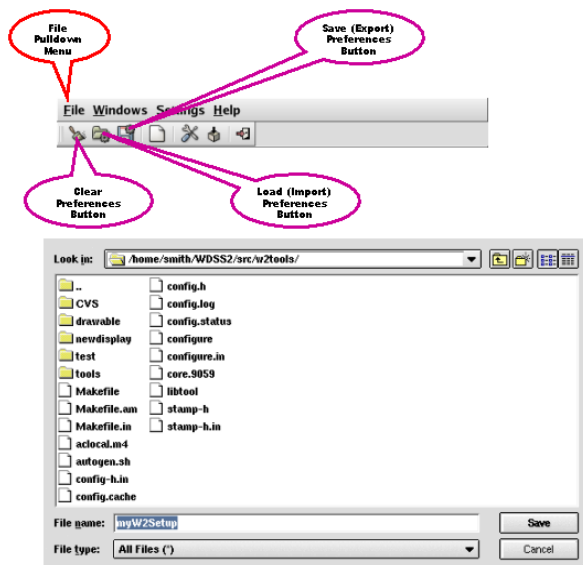


Figure 13. Save Preferences Control Window.

WDSS-II contact list

During the Spring 2003 Proof-of-Concept Test (PoCT) period, the following NSSL meteorologist will be on staff at the NWSFO for most of the convective events to provide technical and meteorological support. Email and mobile phone numbers are provided here:

Greg.Stumpf@noaa.gov	Greg Stumpf	405-826-8644
Travis.Smith@noaa.gov	Travis Smith	405-834-9687
Kevin.Manross@noaa.gov	Kevin Manross	918-408-7014

During times when NSSL staff is not present at the NWSFO, NSSL can provide support during normal work hours, 8am to 5pm Monday through Friday. Remember, WDSS-II is considered an experimental and non-critical system, and thus 24/7 support isn't available. We will do our best to respond to any queries as soon as possible.

For hardware and data flow issues:

Karen Cooper
Karen.Cooper@noaa.gov
405-366-0434
405-834-8559 (cell)

Robert Toomey
Robert.Toomey@noaa.gov
405-579-0825

For software display or meteorological application issues:

Greg Stumpf
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405-366-0477
405-826-8644 (cell)

Travis Smith
smith@nssl.noaa.gov
405-366-0474
405-834-9687 (cell)

For feedback to developers and to report bugs, send email to wdssii_feedback@nssl.noaa.gov. Please describe in detail exactly what you were doing at the time of a crash and include the output from the log.